

REMARKS

Status of Claims

Claims 18-21 and 25-34 are pending.

Claims 1-17 and 22-24 have been cancelled.

Claim 19 is amended to correct a typographical error.

The features of Claim 24 have been incorporated into main Claim 18 in order to better define the invention with respect to the applied reference, commonly assigned U.S. Patent No. 5,672,438 to Banerjee et al ("Banerjee").

37 C.F.R. §1.116(b)(2) states that "[a]n amendment presenting claims in better form for consideration on appeal may be admitted". As will be discussed below, the temperature features of Currently Amended Claim 18 (set forth in the prior Amendment A in Claim 24, now cancelled) clearly distinguish Applicant's invention from Banerjee.

Entry of the amendment, and reconsideration of the rejection in light of the amendment and the following arguments is respectfully requested.

Claim Rejections - 35 USC § 103(a)

Claims 1-17 stand rejected under 35 U.S.C. 103(a) as being obvious over Banerjee et al, U.S. Patent No. 5,672,438 for the reasons set forth in paragraph [5] of the Final office action. This rejection is respectfully traversed.

The Examiner's Admissions

On page 3, lines 1-5 of the Office Action, the Examiner admits that :

"Banerjee does not expressly teach[es] that the solid fluorinated polymer electrolyte membrane having an ion exchange ratio (IXR) of at least about 17; or, methanol cross-over rate is reduced by at least about 20%; or, the power output is increased up to about 15% as compared to a fuel cell comprising a solid fluorinated polymer electrolyte membrane having an ion exchange ratio (IXR) of about 15 and the same thickness as the solid fluorinated polymer electrolyte membrane in (a)."

The Examiner's Arguments

Argument #1 – The Examiner states that it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate a solid fluorinated polymer electrolyte membrane having an IXR of at least about 17 into the direct oxide fuel cell of Banerjee. The Examiner cites *In re Wertheim*, *In re Woodruff* and M.P.E.P. 2144.05 (I) as authority for this proposition.

Argument #2 – The Examiner states that the power output and methanol cross-over improvement are “the mere recognition of latent properties . . . taught by Banerjee” and also that Applicant has merely “recognized another advantage which would flow naturally from the suggestion of the prior art” and cites *In re Wiseman* and *Ex Parte Obiaya* to support these propositions.

Argument #3 – The Examiner relies on Figure 5 of Banerjee for the claimed temperature range now set forth in main Claim 18 which is “operating the direct methanol fuel cell at a temperature of about 20 to about 40 °C”.

Figure 5 of Banerjee

One of ordinary skill in the art, when considering Figure 5 of Banerjee, would observe several facts and reach several conclusions.

First, the fact that the **observed current** comparison **at 50°C** between membrane E of Banerjee having an IXR of 23.1 and membrane C of Banerjee having an IXR of 14.7 shows **membrane C** (not in accordance with Applicant's claimed invention) **to be far superior to membrane E** (a membrane in accordance with Applicant's invention, **BUT NOT** operated in the claimed temperature range about 20 to about 40 °C) for this measured property.

Second, that membrane E of Banerjee is a membrane in accordance with Applicant's invention, **BUT IS NOT** operated in the claimed temperature range about 20 to about 40 °C. The lowest temperature that membrane E of Banerjee is tested at **is 50°C and the current is decreasing with lower temperatures**.

Third, that Banerjee proposes as solutions to the problems of methanol crossover and power generation (a) a membrane (or fuel cell with such a membrane) with an IXR at least about 23 (Claims 1-7 and 15-16) or (b) a laminate membrane and electrode assembly (Claims 8-14).

Consequently, despite the significant solutions proposed and claimed by Banerjee, there is ***absolutely no recognition in Banerjee of the benefit of operating in the claimed temperature range about 20°C to about 40°C with a membrane having an IXR at least about 17.***

Applicant's Invention

Applicant has made the surprising discovery, completely unrecognized by or suggested by Banerjee, that methanol cross-over rate is reduced by at least about 20 % and wherein the power output is increased up to about 15% ***when operating in the claimed temperature range about 20°C to about 40°C with a membrane having an IXR at least about 17.***

What is completely amazing about this discovery is not only that Banerjee does not disclose or suggest it, but that an ***unexpected and unpredicted “flip-flop” occurs*** at the claimed lower temperature regime which results in a ***power density increase*** with improved methanol cross-over performance too.

Response to The Examiner's Arguments

With respect to Arguments #1 and #3, it would not have been obvious to use a membrane having an IXR at least about 17 at the claimed temperature range of about 20°C to about 40°C because Banerjee proposes membranes having an IXR at least about 23 and shows in Figure 5 that ***their performance diminishes as temperatures are lowered to the minimum value of 50°C which teaches away from the invention.*** Table 3 of Banerjee also shows that ***methanol permeability is adversely impacted as IXR is lowered, a second instance where Banerjee teaches away*** from the claimed invention of a membrane having an IXR at least about 17.

With respect to Argument #2, it has been sufficiently established that the claimed invention embodies the ***complete opposite*** of “latent properties” that are disclosed or suggested by Banerjee. It is most certainly true that they would not be expected to “flow from” the disclosure of Banerjee. Banerjee does not disclose or suggest and furthermore teaches away from operating membrane E having an IXR of 23.1 at temperatures lower than 50°C. Membrane E is shown by Banerjee to have lesser performance than membrane C for observed current at all tested temperatures.

Under the facts and circumstances set forth by Banerjee and Applicant's claimed invention, neither *In re Wertheim*, *In re Woodruff*, *In re Wiseman* nor *Ex Parte Obiaya* support a prima facie case of obviousness.

In view of the foregoing, allowance of claims 18-21 and 25-34 of the above-referenced application is respectfully requested.

Respectfully submitted,

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